

painted round a saint's head, extending to a diameter and a half. Looked through the finder, and saw the same form, but very much reduced in size and brilliancy; then examined with the 6in. and eye-piece, and saw nothing but a bright glow round the moon, not much more than the height of the big prominence plainly visible in the S.E. quarter. The last thirty seconds had now arrived, and, as previously arranged, Mr. Lockyer took my place at the 6in., while I again looked through the 6-prism spectroscopic to record anything that might be visible, but I saw nothing. As the spectroscopic was not on the sun's limb at the re-appearance of the light, I cannot state what took place.

During the remainder of the partial eclipse I watched the northern cusp as the moon uncovered the sun, and several times I saw distinctly the four bright lines near C; but saw nothing else worth recording.

The colour of the corona appeared to me a light pinkish white, very brilliant. I saw no streamers. The rest of the sky and everything around had a bluish tinge.

I will now give an extract from Mr. Pringle's report. He was observing with the direct-vision spectroscopic attached to the other 6-inch telescope, and with myself watching the northern cusp, slit radial:

"Until 6h. 47m. (mean time) bright lines C, near D, and F, of uniform brightness, and varying but slightly from normal height. At that time F brightened, C remained bright, line near D very faint. At 6h. 54m. all the lines lengthened to some four or five times their normal height, showing a prominence at the cusp. For the next ten minutes lines varying but little. At 7h. 4m. a large prominence at cusp; bright lines lengthening some eight or nine times their normal height. At 7h. 4m. 30s. a bright line appeared on the more refrangible side of F, and close to it, F lengthening considerably, and bending towards the red. All the before-mentioned lines were now bright, F longer than the rest, and remaining bent, the line near it being one-third its length. At 7h. 13m. observed three bright lines at δ , visible only at the extreme point of the cusp. Half a minute before totality, turned the slit tangential; but the slit not being exactly at the same place as that of Commander Maclear's, both refractors working by the same slow-motion screw [this was owing to the sway of the bars carrying the spectroscopic when it was being turned.—J. P. M.] I failed to obtain any results at the moment of totality. I then observed at the 6-prism just quitted by Commander Maclear, whilst that gentleman, observing at the direct-vision spectroscopic, swept out from the sun on one side, then brought the finder on the dark moon, and thence swept out from the sun on the opposite side. During this time nothing whatever was visible in the spectroscopic. I next observed with the naked eye: corona appeared radial, of a purplish white colour, brightest near the body of the moon; no very long rays perceptible. On holding the head sideways, rays of corona remained permanent, showing none to be due to defect of vision. Next observed corona through $2\frac{1}{2}$ " finder of refractor. Structure well-defined, wavy, nebulous, permanent. Remarkd a curiously-curved portion of corona, divided by a partial rift from an oblique ray. I should imagine the corona to extend about $7'$ beyond the sun, but did not accurately estimate the distance

whilst observing. When thirty seconds of totality remained, I went to finder of equatorial reflector; structure of corona not so apparent with higher power. Several prominences visible; one of large size, structure similar to that of corona. At about twelve seconds before end of totality, a perceptible brightening along the edge of the moon on the side of appearance; a few seconds before end of totality, I went to one prism corona spectroscopic attached to $7\frac{1}{4}$ " reflector. At the end of totality a considerable number of bright lines flashed in (what proportion of the whole I cannot say, perhaps a third). The line near D noticeably bright; continuous spectrum faintly visible a moment before the sun's limb showed. After totality observed at finder, the summit of a large prominence opposite the point of sun's re-appearance visible for several seconds after totality."

During the afternoon I tried to make an accurate sketch of the prominences on the sun's disc, but clouds came on, and I was prevented. It was not worth while keeping the instruments up another day for the purpose, so we commenced, and in two days they were safely packed for Bombay.

The rumours that our presence gave rise to among the natives were very amusing. First we heard that part of the sun was about to fall, and the wise men had come to the East to prevent it. Then when the formidable-looking instruments were seen mounted on the fort, they thought there was a war, and we were engineers going to put the fort in order to prevent a landing. This was strengthened by the fact that the *Glasgow* practised at a target before returning to Ceylon. This gave place to a flood about to descend, and all the Europeans were coming to the high ground to escape it.

When the eclipse commenced the usual shouting and beating of tom-toms went on, but a cordon of police prevented an invasion of the Observatory, and only a confused noise from below reached us.

J. P. MACLEAR

S.S. *Indus*, January 6, 1872

MORSE ON TEREBRATULINA

The Early Stages of Terebratulina septentrionalis. By Edward S. Morse, Ph. D. (Boston Society of Natural History, vol. ii.)

MR. MORSE is one of the band of New England naturalists who have lately been making themselves known to us through that excellent periodical the *American Naturalist*, and who have shown themselves determined to take advantage of the opportunities offered to them by the presence on their sea-board of such zoological treasures as *Limulus* and *Lingula*. Mr. Morse obtained *Terebratulina* in abundance in the harbour of Eastport, Maine, and gives in this paper an account of the change in the form of the shell and the "arms" during development of this Brachiopod from a scarcely visible speck onwards. The changes are illustrated in two plates containing outline figures, and as far as Mr. Morse has observed consist firstly in the passage of the shell from a flat and shorter form to the elongated and convex shape with which we are familiar. Further, the

arms were found to commence as a series of ciliated tentacles placed around the mouth, and as nearly as possible identical with the lophophor of such a Polyzoon as *Pedicellina*. At first but six of these tentacles are seen; these increase in number, whilst the lophophor takes on its horse-shoe shape; and finally by the development of the free ends of the two sides of the horse-shoe the great Brachiopodian arms are produced. This is very interesting, and confirms *a priori* notions. At the same time we must dissent from the stress which Mr. Morse lays on the affinities of structure of Brachiopoda and Polyzoa, in so far as he wishes to separate these two widely from the Mollusca, and join them to a group which he calls Vermes. The Vermes have never been accurately defined, and are in fact at present, as Carl Gegenbaur (whom Mr. Morse cites) fully admits, one of those classificatory lumber-rooms, which are so convenient from time to time in the progress of zoological science. Whilst we fully admit the close affinities of the Polyzoa and the Brachiopoda—now long recognised by all zoologists—we cannot overlook the very strong affinities of these to the true Mollusca. Even a hasty study of the embryology of the Mollusca is sufficient to bring under one's eyes larval forms of various classes bearing many of the characteristics of the Polyzoa on the one hand, and of certain Vermes on the other. The early condition of the gill-plates in some Lamellibranchs is only to be compared to the tentacula of the Molluscoidan lophophor, though presenting so large a shifting in some relations. Rather than detach the Molluscoida (with regard to the Tunicata there are a variety of new facts and considerations which require long discussion) from the Mollusca to place them in the lumber-room Vermes—we should prefer to put the whole of the Mollusca along with them there—a proceeding at present useless, but which would express a truth which Mr. Morse does not seem to admit, though it is indicated by Gegenbaur, and accepted also by Huxley, namely, that there are close genetic ties between the group Mollusca (including Molluscoida), and certain so-called Vermes, such as the Turbellaria, Archi-annelida, &c.

In a paper published prior to this, Mr. Morse has spoken of the Brachiopoda as a division of Annelida, on the ground of certain resemblances between Lingula and Annelids. We are not sure whether Mr. Morse adheres to this startling proposition, or whether it was due to the intensity of the impressions produced by his study of living Lingulæ, which must have been exceedingly interesting. By the way, we may mention that Semper has also studied living Lingula. That there is a fundamental community of organisation between Lingula and Annelids we are, as stated above, not indisposed to believe, but that this can be expressed advantageously by making the Brachiopoda a division of Annelida, or that such a classification would be anything more than reactionary exaggeration, we cannot for a moment suppose. Mr. Morse attaches importance in this regard to the setæ of Lingula, and equal or perhaps more importance to the red colour of the blood. The discovery of red-coloured blood in Lingula is interesting, because in all probability it is due, as in vertebrates and all other causes where it is really red, to the presence of hæmoglobin, and is another instance of the exceptional appearance of this chemical principle in the blood of an animal whose nearest congeners do not

possess it. We should be very glad of confirmation with the spectroscope of the supposed existence of hæmoglobin in the blood of Lingula. But how can Mr. Morse suppose that this red blood, or hæmoglobin-bearing blood, is a character of the slightest classificatory importance? A great number of Annelids do not possess the vascular system at all, which in others carries this red blood; in some the fluid in that vascular system is coloured green by chlorocruorin, in others the hæmoglobin is present in the perivisceral fluid, which is in most Annelida colourless. Certain Mollusca have blood coloured red by hæmoglobin (Planorbis) as deeply and brightly as that of any lob-worm, so again have some Crustacea and Insect larvæ. The presence or absence therefore of hæmoglobin in the blood of Lingula is a matter of complete indifference as far as the relations of that animal to the Annelida are concerned.

We are much interested by a reference in Mr. Morse's paper on Terebratulina to some observations which he has made on the development of Lingula, observations which we hope before long to see published. From these he states that he is led to believe that the supposed Discina larva figured by Fritz Müller might equally as well be that of a Lingula. Some further information about this remarkable larval form will be very welcome.

Mr. Morse apologises for the undetailed character of his drawings, and for the absence of information in his paper upon the development of Terebratulina *ab ovo*—a great desideratum—by the fact that when he went to Eastport to study the development of Terebratulina he had a microscope with him which he found to be utterly inadequate to the purpose. Since this is an error which is easily remedied, we trust that Mr. Morse will soon return to the attack, if he has not yet already done so, duly armed.

E. RAY LANKESTER

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.]

The Solar Eclipse

It does not happen more than once in a lifetime to see such a glorious and magnificent sight as that from which I have just returned; that is, the total eclipse of the sun. I have seen many eclipses before, but never anything to equal this. I was engaged to go with the Morgans to the top of the hill to see it. Got up at six, and found it a lovely morning; rode up to Morgan's, about half a mile, carrying with me glasses, smoked glass, and sun hat. Got there before seven, and found eclipse already begun. Got our two mirrors and watched the hole in the sun grow bigger and bigger. It began from the top, and we all went off to the highest point on the hill, from whence we could see all Ooly and the mountains round. When the eclipse got so far, the cold on the mountain grew much greater, the grass was so wet that no one's boots kept it out, the feet and hands grew cold, and with your back to the sun the light over the country was like twilight, or the earliest dawn. Gradually the lower streak got thinner and thinner, until at last there shone a light like the famous lime-light, and in a moment or two that went out and the sun was totally concealed; many stars were visible, the whole country looked dark—that is, half dark, like moonlight—the crows stopped cawing, and for two minutes and a half the total eclipse lasted, a sight I shall never forget, and then the lime-light again appeared at the bottom rim of the sun, and gradually more and more of him appeared, the crows began again at once, and the